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THE PLANT DISEASE SURVEY

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DISEASES OF VEGETABLE CROPS

BACTERIAL CANKER OF TOMATO

A Survey in Copiah, Hinds and Rankin Counties, Mississippi, May 6 to June 10, 1930

By L. M. Fenner,
Associate Plant Pathologist, Mississippi State Plant Board.

Scope of Survey

The recurrence of bacterial canker disease of tomato in the vegetable areas around Crystal Springs, Mississippi, has been reported in the Plant Disease Reporter, Vol. 14: 96. 1930. The outbreak was at first not considered very serious but it was thought desirable to determine the extent of this disease - its origin, rate of spread, the possibility of soil contamination in the hotbeds and in the fields, and other phases of the subject as might relate to the spread of the disease through cultural practices. The survey which was begun as the result of the field studies of May 6-10 comprises the data obtained on more than 100 farm locations and the observation of more than 250 individual fields or portions of an acreage where two or more varieties were grown adjacent to each other. With the assistance of four State Plant Board inspectors between June 2-10 sufficient progress was made in determining the limitations of the affected area and the source of the infection.

The accompanying map shows the area around Hazlehurst, Crystal Springs, and Terry as the focal points of the occurrence of bacterial canker in Mississippi up to June 10, 1930.

Field Conditions and Cultural Practices

To understand more clearly the difficulties encountered in this survey, a few practices of the tomato growers in this section should be cited. The local growers are accustomed to the purchase of two or three varieties of tomato seed

which are mixed just prior to broadcasting the seed in the hotbed. Even when varieties are seeded separately the transplants are mixed in the coldframes. A very few growers sow the varieties separately and grow the plants unmixed in the field. The early March freeze caused a loss of plants in some fields with the consequence that other plants were used as resets which were of doubtful or unknown origin in the county, in some cases the plants were canker-free and in others the plants were diseased. Data from such mixed fields were practically worthless except to indicate the serious result of using diseased plants among mixtures of disease-free plants. The reports here summarized cover the acreages where the local or out-of-state origin of the seed is definitely known. Accurate statements were not always obtainable on the manner of transplanting the coldframe plants, the source of water for watering hotbed and coldframe plants, the continuous use of water in a vessel by dipping the roots just before sticking out in the field versus wetting the plants in separate containers, the source of drainage waters flowing toward propagating beds and the fields, as well as other questions relative to transmission of bacteria by contact or by wind and by soil contamination.

Relation of Other Diseases and Factors to Bacterial Canker Survey

When confronted with the differentiation between the Fusarium wilt and the bacterial canker disease of tomato, since the latter is new to Mississippi, it was necessary to fix rather firmly in mind the characteristics of each disease as well as to study such factors as might confuse the inspectors in their field examinations. The field survey for bacterial canker was especially favored by the drouth which continued from April 4 until May 18. Accurate percentages of canker could be obtained quite readily. The leaf spot diseases due to Alternaria solani and Septoria lycopersici were not present until several days after May 18. Mosaic had been appearing and had continued to spread since late April due largely to the pruning operations. Fusarium wilt was not present in any large degree prior to May 18. Its appearance the following week did not alter the determination of bacterial canker although the work was slowed up perceptibly. The survey data are not vitiated by such factors as might be attributed to lack of definite symptoms of bacterial canker or to confusion of canker symptoms with symptoms of other diseases. The percentages of bacterial canker found in many fields this year may represent largely those plants with systemic infection resulting from either infected or contaminated seed or both. The lack of rainfall from May 21 to late June has prevented the widespread destruction of the tomato crop by the canker organism although many secondary infections have resulted on the stems and the fruit pedicels. The writer believes that the survey has given proper emphasis to such factors as moisture, temperature, effect of intense sunlight, seed treatment, fertilizers, crop rotation, the use of more than two varieties, and the mode of handling the tomato plants from time of seeding up to the field planting. Careful consideration has been given to soil contamination and it has been impossible to prove such to be true in more than one or two cases. Attempts of tomato growers to ascribe the cause of this disease to one or more local conditions have resulted in failure.

Seed Sources

Seed for the 1930 tomato crop was supplied by more than twelve out-of-state sources, the crop from eleven of these being studied and data recorded. One of these seed sources was non-commercial. More than twenty-five merchants and seed dealers in Copiah, Hinds, and Rankin Counties were distributors of tomato seed this year. The local dealers were either agents for the above mentioned group

of commercial seed producers or the dealers were producers of home-grown seed. Six or seven local dealers were distributors of Mississippi-grown seed. A relatively small number of growers save tomato seed for the ensuing crop.

Seed Treatment

The majority of the seed was not treated. In a few cases Semesan was used and in two cases the Northern seed firms used mercuric chloride at the rate of one part of the salt to 3,000 parts of water for 5 minutes. The use of Semesan was restricted largely to the seed from one local distributor, each grower being urged to treat his own seed. Plants of this particular seed lot from a known out-of-state seed company (No. 10, table 20) showed canker almost invariably. Two different seed lots which were treated with mercuric chloride by two northern seed firms (No. 3 and No. 8), did not show canker, this being due in all probability to the fact that the seed from these seed firms was neither contaminated nor infected.

Hotbed Preparations and Location

The beds are usually located in a protected place or on a sunny slope. Beds are used at least two years, or longer, but many growers start a new bed each third year. Nearly all the growers practice soil rotation, the old compost and soil of the previous year being removed usually during the summer months. The survey reports show several cases where entirely new frames, new sash, new locations, and fresh compost with new woods dirt had been employed, yet the season's tomato crop was badly affected by the canker disease. Only a very few cases might indicate hotbed soil contamination but in such cases the percentage of infection, in the field-grown plants, was much too high to account for infection probably resulting from contaminated soil around the edge of the hotbed. Hotbed plants are rarely watered since damping off organisms are to be avoided. Contamination of water supply is unlikely since this disease is of very recent occurrence in Mississippi. The contamination of barnyard compost is highly improbable.

Coldframe Plants

When the hotbed plants are 3 to 5 inches in height, they are set in coldframes which have been prepared in the open field either within the location of the field itself or at a nearby point. This soil has been enriched usually by the application of a 4-8-4 fertilizer prior to placing the frame. Since the coldframe soil is always new or corresponds with the usual 3-5 year rotation of the tomato crop, no significance is attached to the possibility of infection resulting from infested soil in the coldframe. Very little water is added to such plants in the frames and no contamination from drainage water has been noted. Data on hotbed and coldframe plants indicate some relationship between nutrition and environment with respect to disease symptoms. Hotbed plants have not shown the disease for a period of 120-150 days from time of seeding, while coldframe plants show the disease within 60-90 days after being set in the frame, i.e. the symptoms are three to four weeks earlier than in the hotbed plants. This relation has appeared to vary somewhat as fewer pronounced symptoms were noted in coldframe plants grown on well-fertilized soil versus plants on unfertilized soil. The latter case shows that severe necrosis may appear in a somewhat shorter period.

Rotation of Crop

A few growers return tomatoes to the same field after two years but the majority of the growers use a four or a five year rotation. The short rotation results in heavy Fusarium wilt infection. However, the present survey indicates less wilt on the land under longer rotations, but there has been some wilt on entirely new land probably due to the Fusarium fungus being in hotbed soil. The possibility of bacterial canker being present, especially after a short interval, has been investigated. Our data show bacterial canker in plants this year where the crop was grown 2-5 years previously and that the disease is present also on new land. Bacterial canker and Fusarium wilt have not been observed in the seme plants, so it is thought that if the bacteria were coincident with the Fusarium fungus in the soil for at least two years, both diseases would appear together. The latter condition has not been noted during the survey. The growers with few exceptions claim not to have observed this disease in their crops in previous years. Only one case where the canker has seemed to have been recognized by the grower would indicate soil carry-over for two or three years and in this field only a trace of wilt was observed.

Tomato Varieties in Single and Mixed Stands or Mixed Sources with the Distribution of Canker as to the Seed Source.

Fields with One Variety

Reference has been made to the mixing of tomato seed from different sources or different varieties. The inspection reports show that 20 sources of both local and out-of-state seed were found in Copiah County in which the variety from each source was not mixed. A total of 85 fields was inspected, 57 of which were clean and 28 fields had bacterial canker. Plants from three of the seed sources (northern grown) show canker and only one source (suspected to be Mississippi-grown) had plants with canker, probably introduced the previous season from an out-of-state locality. This one case might be due to hotbed soil contamination in 1929 but the point has not been clearly indicated by available data. In Hinds County, 5 seed sources are represented separately in single stands in 24 fields. Four seed sources, in Hinds County are from the same sources as in Copiah County and seed from the fifth source is locally grown in Hinds County. Canker was not found in any single stands in Hinds County. Only two (or three) seed sources were used separately in single stands in Rankin County comprising 15 fields for the two known sources while the third source from a local distributor (Mississippi-grown?) had 2 fields. A total of 17 fields with one variety stands was inspected. Not one field in Rankin County had canker. To summarize a total of 126 fields with a single variety was inspected for canker in the three counties. Twenty-eight fields had canker, of which 20 fields came from a definitely known out-of-state seed source, 3 fields from a second out-of-state seed firm and 4 fields from a supposedly home-grown seed. All fields from the first source (No. 10) showed canker present while nearly 50 per cent of the fields from the second source (No. 7) had canker. A third out-of-state seed source (No. 11) had canker showing in one field but no other fields could be located as a check on this record. (See table 20).

Fields with Two to Four Varieties

In addition to the fields with one variety, 51 fields in Copiah County, 44 fields in Hinds County and 39 fields in Rankin County were inspected where the grower used two or more varieties (or sources) in each field. Of the 51 fields of mixed varieties inspected in Copiah County 26 fields had canker. Forty-two fields out of 65 mixed stands showed the disease in Hinds County and not one field out of 39 in Rankin County had the disease. In all the combinations of mixed varieties, the fields showed no bacterial canker when either or both of the out-of-state sources supplying contaminated seed, were not represented. By inspection of single stands and with data as to the local distribution of seed from above-mentioned seed sources (Nos. 7 and 10; see table 20), there has been no difficulty to determine which of the sources has introduced bacterial canker in the mixed stands.

Summary of Data on Single Variety and Mixed Stands

A total of 281 fields was inspected of which 136, 89, and 56 fields were in Copiah, Hinds, and Rankin Counties respectively. Fifty-four fields in Copiah County had canker; 42 fields in Hinds County showed the disease and not a single field had canker in Rankin County. Of the 281 fields, 185 were clean and 96 fields had canker, i.e. in 34.16 per cent of the fields inspected, the disease was present. In Copiah County 39.7 per cent of the inspected fields had canker while 47.1 per cent of the fields in Hinds County had the disease present.

Table 20. Distribution of bacterial canker of tomatoes. (In plants from Mississippi seed versus out-of-state seed in unmixed stands, Copiah County, Miss.)

No.	Variety	No. fields			No. of out-of-state seed companies											
		Total	Per cent Clean	Per cent Dis.	1	2	3	4	5	6	7	8	9	10	11	12
1	Break O'Day	1	100	0												x
2	Crystal Spgs. Mkt.	12	0	100										x		
3	" " "(a)	7	100	0												
4	" " "(b)	1	100	0												
5	Globe (a)	2	100	0												
6	"	2	100	0		x										
7	"	1	100	0				x								
8	" (a)	8	100	0												
9	"	1	100	0					x							
10	Liv. Globe	2	100	0			x									
11	" "	4	100	0							x					
12	Globe	8	0	100										x		
13	" (c)	4	0	100												
14	" (a)	6	100	0												
15	"	1	100	0						x						
16	" (a)	4	100	0												
17	Gulf State Mkt.	9	66.6	33.3						x						
18	" " "	7	100	0			x									
19	Globe (b)	2	100													
20	Marglobe	3	66.6	33.3											x	

Explanation of table 20.

(a) Mississippi-grown seed in 1929.

(b) Mississippi-grown seed in 1929 from the local grower who supplied seed of the Crystal Springs Market variety for increase by an out-of-state seed firm (No. 10) during 1929. Note the freedom from canker in Mississippi-grown seed vs. presence of canker in seed from source No. 10.

(c) The exact history of the seed source is in doubt. If the seed was grown in Mississippi, the disease resulted from an old contaminated 1929 hotbed or from field grown infected plants in 1929.

Out-of-state sources Nos. 1, 6, and 9 were represented only in Hinds and Rankin Counties, while acreages from the other nine sources were observed in Copiah County in comparison with eight Mississippi seed sources.

ECONOMIC IMPORTANCE OF BACTERIAL CANKER

This brief survey and study of the tomato fields affected has emphasized the entirely destructive nature of the disease. While the disease was confined to a comparatively small part of the total acreage in tomatoes, canker has been epiphytotic in its occurrence in the several plantings where the spread of the disease was limited by the extremely dry season. The fact that severe infection occurred in certain fields with a single variety has indicated heavy contamination or infection of the seed. Where two or more varieties were present in a field, the actual percentage of infection was lowered but in the variety alone which had infected or contaminated seed the percentage of infection remained high.

The results of the survey do not indicate any difference in varietal susceptibility. Introduction of the bacterial organism with the seed this year was responsible for the disease being confined to two or three varieties. The varieties most favored by Mississippi growers are the Globe, Gulf State Market, Crystal Springs Market, and various home selections from parent stock closely related to these varieties. Marglobe is seldom planted. All varieties both of the canner and shipper types are considered to be susceptible, therefore little encouragement exists at present for a resistant variety.

The acreage inspected was in excess of 600 acres, more than 400 acres being in Copiah County, nearly 150 acres in Hinds County and 60 acres in Rankin County. Approximately one-third or 200 acres had plants which contained variable amounts of the disease. Less than 5 per cent of the tomato acreage in this vegetable section was inspected. Information on seed distribution indicates that less than 10 per cent of the acreage was affected. Computation of losses based on labor, fertilizer, total investments for the crop and expected sale of fruit at 75 cents per flat crate (4 baskets) would indicate the total loss per acre to be from $300 to $600 and in some cases the losses would reach $800. Actual losses are difficult to compute on mixed stands but in fields where the infection was 20 to 60 per cent, only 10 to 20 per cent of the crop was harvested. Other acreages were a total loss, the infected plants being plowed up before the harvest season had started.

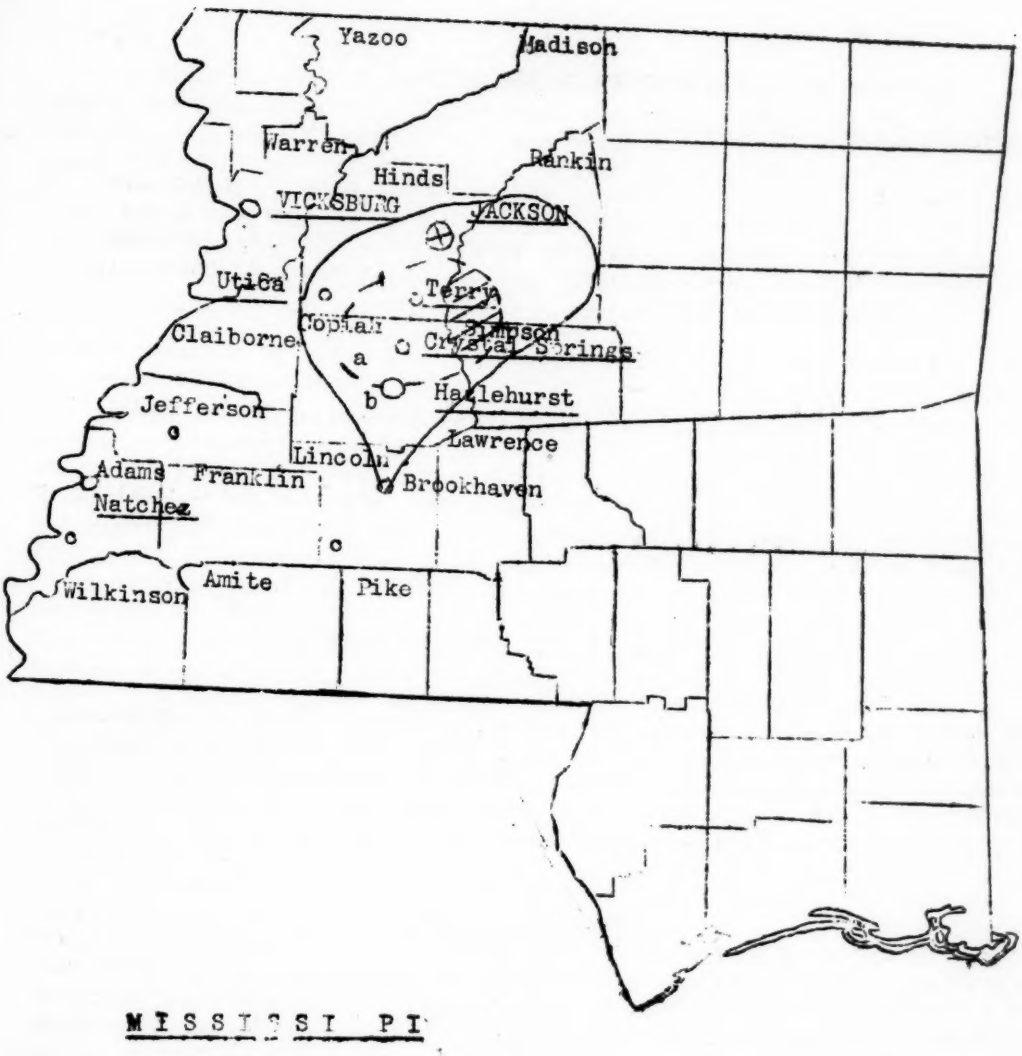

Figure 8. Area surveyed and scouted for Bacterial Canker of Tomato, May 6-June 10, 1930. (a) Sections of Copiah, Hinds, and Rankin Counties including a small section of Simpson County. Shaded sections of Rankin and Simpson Counties indicate canker disease may have been present but not reported during survey. The foci of distribution were Crystal Springs and Terry. (b) Irregular zone where disease was not recorded by less intensive scouting. Canker is unlikely to have occurred in this zone. (c) Other areas observed by Plant Board Inspectors but no reports of canker were received.

Losses in 1930 in certain small acreages where the percentage of infected plants averaged less than 50 per cent, were less than in 1929. In the previous year, 10, 50, and 100 crates per acre would have been a fair yield from the diseased tomato fields while in 1930, 250 to 300 crates were produced. The increased production from canker-fields in 1930 over the average production in 1929 is due entirely to lack of rain. In a season of moderate rainfall, severe systemic infection of the plants as well as secondary fruit infections are to be expected. The normal yield averages in disease-free fields, 400 crates per acre. Actual yields as high as 750 to 1,000 crates have been obtained.

CONTROL

Clean or disease-free seed is the starting point for avoiding bacterial canker. That fact is emphasized by the high percentage of canker-free fields which had plants from sources known to be free of the disease. Extreme care in sanitation of the hotbeds, using care in selecting a new location, new compost and new woods dirt each year. Old hotbed soil, diseased vines and fruit or soil from a field which had canker on it, should be avoided. Refuse from the tomato fields should not be allowed in the barnyard compost. All manures from whatever source in the community or shipped from outside points are possible sources of soil contamination. Crop rotation over a period of five years seems most desirable at present as a general practice although a lesser number of years may remove the danger on old bacterial canker areas. Seed disinfection is only partially successful even with corrosive sublimate at the rate of 1 part to 3,000 parts of water, soaking the seed 5 minutes and then drying at once. This method destroys only the bacteria on the seed coat and not underneath the seed coat. Removal of infected plants from the fields is not advisable. When 1 to 5 per cent of the plants are diseased, roguing in the field at an early date can be effective.

SUMMARY OF SURVEY

Careful consideration of the cultural practices of the tomato growers indicates that the wide distribution of bacterial canker of tomato in Copiah and Hinds Counties was not due to the manner of preparing hotbeds, coldframes, use of old tomato land in short rotation, types of commercial fertilizer application, or to presence of insects. A field conference was held on May 20, at Crystal Springs with Miss Mary K. Bryan, Bureau of Plant Industry, Dr. L. E. Miles, Plant Pathologist of the Mississippi Agricultural Experiment Station, and the writer being present. Examination of several canker locations lead to the united opinion that the disease resulted from the introduction of contaminated and infected tomato seed. Mississippi-grown seed produced canker-free plants. The majority of the seed from out-of-state sources did not have the canker organisms but two or three seed sources from widely separated points in the United States were responsible for the 1930 outbreak of bacterial canker.

VEGETABLE DISEASES IN FLORIDA

The following reports on diseases of cabbage, Chinese cabbage, collards, kohlrabi, cauliflower and turnips were sent in by G. F. Weber (July 25).

CABBAGE

Southern blight (Sclerotium rolfsii). Not found in epidemic form, but can be seen in most cabbage fields in early fall or late spring. Not common in the winter.

Drop (Sclerotinia sclerotiorum). One of the worst winter diseases of the host in the State. The fungus is statewide and can be found wherever cabbages are grown. The principal stage is the rotting of half matured plants in the field.

Downy mildew (Peronospora parasitica). Found to be very destructive on seed beds in the early winter, often necessitating replanting. Common on plants in the field but not destructive except when followed by bacteria and saprophytic fungi.

Powdery mildew (Erysiphe polygoni). Common and widespread but rarely causing any material damage.

Wire stem (Corticium vagum). Found on early fall seedlings in the seed bed. The trouble is neither common in the winter nor spring unless seed beds are carelessly handled. Common in State.

Black rot (Bacterium campestre). Seems to be increasing in importance as a disease in this State. During the past season it was found in almost every field examined. The plants in early stages are killed. Leaf infection is very common.

Peppery leaf spot (Phytomonas maculicola). Has been found in scattered places but is neither generally distributed nor severe.

Black leaf spot (Alternaria brassicae). Very common in the State wherever cabbage is grown. It becomes worse as the spring season advances. The winter damage is slight, whereas, May damage is considerable.

CHINESE CABBAGE

Black leaf spot (Alternaria brassicae). Usually of considerable importance wherever the host is grown, defoliates plants and opens way for soft rotting bacteria.

Leaf spot (Cercospora bloxami). Occasionally found to be destructive on newly set plants.

COLLARDS

Black rot (Bacterium campestre). Common and general over the State. Usually leaf margins infected.

KOHLRABI

Downy mildew (Peronospora parasitica). Very common and destructive on this plant most of the year, especially serious in the seed bed.

RUTABAGA

Powdery mildew (Erysiphe polygoni). Very serious on this host during most of the year, usually kills the plants in the early spring.

CAULIFLOWER

Black rot (Bacterium campestre). Caused considerable loss of plants previous to the heading time and also the rotting of mature heads, usually of internal origin from root infection.

Downy mildew (Peronospora parasitica). Especially destructive on seedling in seed bed and shortly after setting in field. Less common on heading plants.

TURNIP

Leaf spot (Colletotrichum higginsianum). Generally distributed in the State, often entirely defoliates plants in a short time.

Black leaf spot (Alternaria brassicae). Common on the host wherever grown in the State.

Mosaic (virus). Collected in several isolated fields in the vicinity of Gainesville, not common.

POTATO DISEASES IN MAINE

Late blight (Phytophthora infestans). Found on foliage in several parts of Aroostook County by Reiner Bonde and others during week of July 14, which is an unusually early calendar date for its appearance. Sunshine is reported to have been rare and rainfall abundant in this region since planting. In other parts of the State, while showers have been frequent, the season has been rather dry and sunny.

Leaf roll and stem-end browning (undet.) Last winter, net necrosis and stem-end browning were more common than usual in Aroostook County in Green Mountain potatoes. (The former term has been applied to a type of discoloration first depicted by W. A. Orton and later found to be occasionally the first effect of the disease entering the tubers. The latter term, in the absence of wilt diseases in Aroostook County, has become the one for stem-end discoloration of unknown cause). In experimental tests, of tubers planted as having net necrosis, 99 per cent produced leaf roll plants, while of tubers planted as having stem-end browning, only 6 per cent produced leaf roll plants. Thus, while the two maladies intergrade to some extent, they can be distinguished from each other to a large extent. In accordance with the occurrence of more net necrosis than usual, there is more leaf roll than usual. In 1929 in experimental plots there were more plant lice and more leaf roll spread than usual. Whether there will be spread in 1930 with danger of more net necrosis, can be forecast only with uncertainty even if the single variable, number of aphids, is known.

(Donald Folsom, July 1)

CANTALOUPE DISEASES IN TEXAS

Downy mildew (Pseudoperonospora cubensis). Very common this year on cantaloupes in all parts of the State, causing severe burning and destruction of foliage.

Leaf spots (Cercospora cucurbitae and Phyllosticta cucurbitacearum). Spots are minute, round and usually appear in large numbers on the affected leaf. It seems that both of the above fungi are involved in this spotting, although Cercospora cucurbitae seems to be the more predominating organism. (J. J. Taubenhaus, July 15)

WATERMELON WILT IN ARIZONA

Material sent in from one field near Yuma was affected with wilt (Fusarium niveum). Collected also at Marana near Tucson where approximately 3 per cent of the field was affected. (J. G. Brown, July 1)

CUCUMBER AND LIMA BEAN DISEASES IN VIRGINIA

CUCUMBER

Downy mildew (Pseudoperonospora cubensis). Now general in all cucumber fields in the Fentress and Norfolk sections. The plants in most of the undusted fields are now dead, but those that have been dusted with copper-lime dust seem to be staying green a little longer. A conservative estimate would place the loss between one-third and one-half the crop. (H. T. Cook, July 10)

LIMA BEAN

Stem rot (Sclerotium rolfsii). Found in two fields of lima beans. The loss due to this disease was about 1 per cent of the stand in one field and about 25 per cent in the other. (H. T. Cook, June 27)

CUCUMBER SCAB IN MINNESOTA

Scab (Cladosporium cucumerinum) caused a heavy outbreak in largest vegetable greenhouse in Twin Cities. Fifty to seventy-five per cent loss amounting to several thousand dollars. Overhead irrigation was used until scab became abundant. (Sect. Pl. Path., July 1)

DISEASES OF CEREAL CROPS

NEMATODE DISEASE OF WHEAT IN GEORGIA

A few days ago some specimens of nematode (Tylenchus tritici)infested wheat heads were sent to the Georgia Experiment Station from a farm at Clermont, Hall County, Georgia. Cursory investigation has shown the disease quite prevalent in the neighborhood from which the specimen was received. An attempt to trace the origin of the seed has developed the fact that it was grown locally and has been badly diseased during the past two years. The loss this year on three farms was estimated at 15 per cent, and one grower estimated his loss last year to be much higher than that figure, possibly 50 per cent. These estimates are probably low because of the difficulty of estimating loss from stunted plants that produce a reduced amount of normal grain. (B.B. Higgins, June 28.)

TAKE-ALL OF WHEAT IN NEW YORK

Take-all (Ophiobolus graminis) of wheat is far more prevalent this season in New York State than it has been for several years. Wheat seed inspectors report as high as 20 per cent loss in individual fields. In most cases, however, the trouble occurs in small patches and does not include a high percentage of the entire field. (Charles Chupp, July 17.)

CEREAL DISEASES IN KANSAS

WHEAT

Stem rust (Puccinia graminis tritici). Small spots of primary infection appeared in southern Kansas about the middle of May. A few badly rusted leaves or even whole plants could be found in early every field by May 20. Secondary spread from these spots was very slow due to low temperatures. The rust in the primary infections often reached the telial stage with out any noticeable spread. A light infection appeared in all parts of the State just before harvest. Late wheat in the Manhattan nurseries was rusted heavier than had ever been noted before. The damage to the commercial crop in most parts of the State was negligible due to the lateness of the attack. Some damage was reported from the vicinity of Parsons. Heavy rains occurred in May and early June but temperatures remained low in May.

Leaf rust (Puccinia triticina). Infection was generally late in the season and very heavy in the central part of the State. Very light infections occurred in the eastern and western fourths of the State. At Manhattan the infection was extremely heavy. Damage to the commercial crop was probably slight, except in central part. In all sections infection appeared very late due to unfavorable temperatures. Losses from leaf rust probably were smaller than in 1929.

Loose smut (Ustilago tritici). This disease was much more prevalent in Kansas than at any other time in the last ten years. It was observed in unusually large amounts on winter wheats in all parts of the State whereas heavy infections of loose smut usually are seen only in the northeastern part. Many fields were visited in which 0.25 to 0.5 of the heads were smutted. The spring season was dry in March and April with much rain in May and early June. A great deal of rain fell at flowering time in 1929.

Bunt (Tilletia laevis). Considerable bunt occurred in untreated fields of the western third of the State. Copper carbonate seed treatment is gradually reducing the amount of bunt in Kansas but considerable can still be found in non-Farm Bureau counties. The season seems to have been favorable for the development of bunt.

Leaf blotch (Septoria tritici). Heavy infection of leaf blotch occurred in Kansas again in 1930. Varieties of hard wheat were very heavily infected by June 10, and the leaves of such varieties as Kanred, Turkey, and Blackhull were nearly all killed long before maturity. Certain of the soft wheats again showed considerable resistance. The disease was severe in all parts of the State except the northwestern counties.

Glume blotch (Septoria nodorum). Glume blotch was present in occasional fields but usually only in small amounts. Much more damage was caused by leaf blotch than by glume blotch in 1930.

Black chaff (Bacterium translucens undulosum). Black-chaff occurred only in isolated spots in the State. Some damage was reported in lodged fields, but for the State as a whole the loss was negligible. On experimental sowings at Manhattan, Hope was heavily infected.

Scab (Gibberella saubinetii). Only a very light infection of scab occurred in Kansas in 1930. A very small amount was seen in a field of the eastern part of the State and in experimental sowings at Manhattan.

Basal glume rot (Bacterium atrofaciens). A very heavy infection of basal glume rot appeared in Kansas about June 15. In many fields 10 to 25 per cent of the heads showed one or more lesions. Frequently nearly every spikelet on the infected head has basal lesions. Much of the grain from such heads shows black points. Kawvale and Harvest Queen seemed to be very susceptible in experimental sowings at Manhattan and Hays.

L. E. Melchers reports fields in Ness County that were damaged at least 50 per cent. It runs more or less prevalent in most fields of this county and is the first time that an epidemic of this disease occurred in any county.

Foot rots. Very prevalent in 1930, especially in south-central and southwestern Kansas, where drought in April injured the crop. Tremendous amounts of crinkle joint and white heads.

Powdery mildew (Erysiphe graminis). Considerable in lodged spots during wet weather of May and Early June. Damage slight. (C. O. Johnston, July 15)

OATS

Stem rust (Puccinia graminis). Practically absent in Kansas oat fields until a few days before harvest when small amounts were observed. Late maturing varieties at Manhattan were severely rusted in early June.

Crown rust (Puccinia coronata). Practically absent until just before harvest. Kanota escaped injury by early maturity. Late varieties in experimental sowings at Manhattan were rather heavily rusted.

Loose smut (Ustilago avenae) and covered smut (Ustilago levis). Smut was very prevalent in 1930. Fields sown with untreated seed frequently had 10 per cent or more of smut. Some fields with 25 per cent of smut were reported. Fulghum and Kanota often were badly smutted. Both formalin and Ceresan treatments have given good control with the former having a slight advantage in effectiveness.

Blast (undet.). Very severe in Kansas in 1930. Seemingly more than in the average year. Kanota which is usually rather free from blast often showed considerable in 1930. Very severe in white seeded varieties in experimental sowings at Manhattan.

Halo leaf blight (Bacterium coronafaciens). Very severe on certain varieties in experimental sowings at Manhattan. Practically absent in the commercial crop. (C. O. Johnston, July 15)

BARLEY

Stem rust (Puccinia graminis). A very small amount appeared just before harvest. Traces were noted in experimental sowings at Manhattan on June 29, at which time most varieties were being harvested.

Scald (Rhynchosporium secalis). Much less prevalent than in the average year. This disease usually is fairly abundant in northwestern Kansas but only the barest traces were observed in 1930. Most fields seemed to be free from scald.

Stripe (Helminthosporium gramineum). Less stripe than usually was present in Kansas barley in 1930. Many fields seemed to be free from stripe while many others showed only traces of the disease. A moderate amount of stripe was seen in Local Six row (Stavropol type) in the northwestern part of the State. Ceresan treated plots at Bird City, Cheyenne County, were free from stripe.

Loose smut (Ustilago nuda). Loose smut of barley was more severe in Kansas in 1930 than usual. Nearly every field in the barley growing counties of the northwestern part of the State was heavily infected. Many fields seemed to have nearly 5 per cent of the heads smutted. Ceresan treatment did not give control.

Covered smut (Ustilago hordei). Covered smut was less prevalent in Kansas barley in 1930 than it has been in recent years. A moderate amount occurred in a few fields of the extreme northwestern part of the State.

Spot blotch (Helminthosporium sativum). Less prevalent than usual in the commercial barley growing areas of the State but fairly prevalent in experimental plots at Manhattan.

Net blotch (Pyrenophora teres). Somewhat more prevalent than usual in the barley growing counties of northwestern Kansas. In many fields it was more prevalent than spot blotch. Fairly abundant in experimental sowings at Manhattan.

Scab (Gibberella saubinetii). Less prevalent than in 1929. Only observed in very small amounts in experimental sowings at Manhattan. (C. O. Johnston, July 15.)

CEREAL DISEASES IN NORTH DAKOTA

WHEAT

Stem rust (Puccinia graminis). A small trace found at Fargo, but no damage up to this time. First appearance was very late, compared with other years.

Leaf rust (Puccinia triticina). A very small amount has developed but is causing no damage.

Loose smut (Ustilago tritici). Prevalent but not very abundant. Much less than a year ago.

FLAX

Heat canker (non par.) is causing considerable damage over the State in general. The injury occurs in practically all fields, in degrees ranging from a trace to a considerable amount. The very early sown flax shows scarcely any canker while that sown later will be damaged considerably in many fields.

Wilt (Fusarium lini). No unusual amount of wilt has been reported from any region. Much of the flax now growing is resistant to wilt.

Chlorosis (Undet.) A relatively uncommon "chlorotic" condition has developed in many flax fields in the Red River Valley. This trouble is easily recognized at a considerable distance by the yellow color of the affected plant. The condition occurs only on flax plants which are relatively small, that is from 2 to 10 inches tall. As the plants advance in age and size the chlorotic condition is disappearing, although the affected leaves and stems have mostly died. There is a tendency for "chlorosis" to develop in spots in the field, however, in many instances this year, the spots are numerous and closely set, causing considerable damage.

The cause of this trouble is not well understood but it appears to be a physiological condition brought on by adverse weather conditions. (W. E. Brentzel, July 15)

CEREAL DISEASES IN MINNESOTA

WHEAT

Stem rust (Puccinia graminis). Traces found generally throughout the winter wheat area.

Leaf rust (Puccinia triticina). Quite general on both winter and spring wheat, the infection ranging from a trace to 3 per cent on winter wheat and a trace to 1 per cent on spring wheat.

BARLEY

Loose smut (Ustilago nuda) is quite prevalent in southern Minnesota, especially on smooth awned varieties. Fields showing 10 to 15 per cent not uncommon.

FLAX

Rust (Melampsora lini).

Traces in most fields in southern Minnesota. (Section of Plant Pathology, July 1, 1930).

FRUIT DISEASES

PHONY DISEASE OF PEACH

In addition to Georgia and some sections of Alabama where the disease of peach trees known as the phony disease is prevalent, inspectors, during recent scouting trips, have definitely identified the phony disease in the following States:

LOUISIANA	Ouachita County
MISSISSIPPI	Covington County
	Simpson County
	Hinds County
	Madison County
	Montgomery County
	Leflore County
	Sunflower County
	Washington County
ARKANSAS	Drew County
	Bradley County
	Cross County

TENNESSEE	Bradley County Franklin County
NORTH CAROLINA	Anson County
SOUTH CAROLINA	Saluda County Aiken County Greenwood County (K. F. Kellerman, July 24).

Details of the findings in South Carolina are of particular interest and are summarized as follows from letters of Dr. L. M. Hutchins to Dr. M. B. Waite.

"Phony trees were found as follows:

One, four miles south of Aiken,
One, in a backyard in the town,
One, in a home orchard at the city limits to the North,
Three, in an orchard three miles northeast of Aiken,
Two positive and 3 suspicious trees, 2-1/2 miles N.W. of Aiken on the Edgefield Road.

In the case of the phony Elberta in the home orchard in Aiken, the owner stated that the tree came from a nursery in Georgia. The source of the other cases could not be traced.

At Ridge Spring, South Carolina 41 phony trees were found in an orchard of 3,000 Elbertas planted in 1920, the trees coming from the Pine Mountain district in Georgia, where the disease has been present to a limited extent for many years. The most interesting thing about this orchard is that some of the original phony trees appear to be still standing and there is a succession of newer cases through the years down to cases appearing for the first time in 1930. The oldest cases could easily have been infected as nursery trees and could have started the spread of the disease at Ridge Spring. The spread in the orchard is comparable to its spread here, the new cases being scattered and not in close colonies."

PEACH ROSETTE IN SOUTH CAROLINA

On July 17 I was interested to find a typical case of peach rosette in a seedling tree eight years old in the seedling orchard of W. C. Sanders about ten miles north of Aiken on U. S. Route #1. The tree was in the last stages of the disease and will probably be dead within a few weeks. No other cases were observed in this orchard nor in roadside peaches or plums along the way. (L. M. Hutchins, July 21, 1930).

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DISEASES OF SPECIAL CROPS

AN OUTBREAK OF SORE SHIN IN TOBACCO IN EASTERN NORTH CAROLINA

By W. W. Garner

In company with Messrs. C. B. Williams and E. Y. Floyd of the College of Agriculture and Engineering at Raleigh and E. G. Moss of the Bureau of Plant Industry and N. C. Department of Agriculture, the writer recently had an opportunity of inspecting a large acreage of tobacco in the counties of Harnett, Wake, Johnston, Wayne, Wilson, Edgecombe, Greene, Pitt, Martin and Bertie. Most of this region is included in the New Belt portion of the North Carolina flue cured tobacco district. The crop as a whole was observed to vary widely in stage of maturity attained, a considerable acreage being quite late. With some notable exceptions, the crop showed rather poor growth due primarily to unfavorable weather conditions, which included alternating extremes of drought and excessive rainfall. A feature of the weather conditions worthy of special mention was the extremely high temperature which had prevailed shortly before our visit. Mosaic was rather widespread but no other disease seemed to be of particular significance except a type of sore shin or stem rot which in most of the territory covered was the outstanding disease of concern to the growers.

With respect both to the territory as a whole and to the individual crop the distribution of the disease seemed to be more or less general. There were wide differences in the severity of the symptoms and in the percentage of plants affected but very few crops seemed to be free of the disease. In some crops and particularly in certain portions of the field nearly all plants showed injury. According to growers, the symptoms developed at an alarming rate during the period of high temperature. Aside from the seat of injury at the ground surface the most prominent symptoms were wilting and yellowing of the leaves. This type of sore shin differs in its effects from that more commonly seen in tobacco in that but few of the plants topple over in the field. Such widespread outbreaks as the present one are not commonly seen. The disease appears to be due to Sclerotium rolfsii which was isolated from a specimen taken in the vicinity of Smithfield. No attempt was made to estimate the damage to the crop though undoubtedly it will be considerable.

FIELD SURVEY OF TOBACCO DISEASES IN SOUTH CAROLINA

By George M. Armstrong

Mosaic is undoubtedly the most common tobacco disease in South Carolina other than Frog-eye. Losses from Mosaic are much greater than that from any other disease. Ten of the 50 fields from which records were obtained were damaged from 10 to 60 per cent. This proportion will not hold for the entire State, however, since the survey was made in cooperation with County Agents, who took me to many fields about which complaints had been received.

Ring-spot. Ring-spot was seen in five fields and in three cases where Ring-spot and Mosaic occurred together a serious breaking down of many leaves was occurring.

Leaf Spots. The season has been very dry in South Carolina and the losses from leaf spots have been reduced to a minimum. Last year Angular leaf spot could be found in a great majority of the fields, sometimes occurring as high as the eighth or tenth leaf. It could not be found in some of the same fields where such conditions occurred last year and I saw only two tobacco leaves on the entire survey that were badly spotted with this disease.

Frog-eye was present in many fields on the two bottom leaves. The spotting was not abundant in most cases.

Bacterial wilt. My records show 18.3 per cent of the fields infested with Bacterial wilt. This figure is much too large for the State as a whole since probably less than one per cent of the fields are so affected. Losses from this disease are striking and the County Agents had received calls for help in a large number of cases where the disease is to be found.

Soreshin. In spite of the dry weather Soreshin was fairly prevalent and was causing as much as 12 per cent loss in one field. All County Agents report that damage from Soreshin was more widespread in 1929, which was classed as a wet season.

Hollow stalk. This disease was causing minor damage in three fields.

Root-knot. My records show root-knot present in 13.3 per cent of the fields. I feel sure that it is present in a large percentage of the fields although I did not dig up plants unless the stunting was quite prevalent. Reports from the growers indicated that there were sections in several of the counties where root-knot damage is quite prevalent but these were not visited.

Frenching. This trouble was not widespread and was seen in four fields near Darlington.

Potash-hunger. This trouble was seen in a rather mild form in 18 per cent of the fields. Probably 35 to 40 per cent of the fields seen in Horry County showed Potash-hunger. Time did not allow records to be made on the large number of such fields which were passed in riding through the county.

Sand-drown. Only two outstanding cases of Sand-drown were seen and these were both in the eastern part of Marion County and on very sandy soils.

Blackfire. The records show that 10 per cent of the fields were affected with Blackfire. These records refer only to mature plants. If replants were included the records would probably show 100 per cent of the fields affected. Extremely high temperatures were encountered during the week of the survey and many replants were suffering from this trouble. (July 6 to 12.)

SEED BED SURVEY FOR TOBACCO DISEASES IN SOUTH CAROLINA

By George M. Armstrong

There were 43 record sheets filled out, though some of them represent as many as five or six different beds all showing about the same conditions.

During the first three days of the survey I found most of the plants quite small. During the last three days of the survey plants had been set from quite a number of beds. The only disease which was at all prevalent was a Phyllosticta leaf spot and it is recorded in 18 of the 43 records. This leaf spot was only of minor importance in any case. Only two beds showed appreciable damping-off. Five beds showed an inconsequential leaf spotting which I thought might be due to Angular leaf spot. The report from the Office of Mycology and Disease Survey was "cause unknown".

The plant beds are generally placed in the woods as shown by 40 of the 43 records. No method of sterilization in the seed bed is used except burning,

which was practiced in about 50 per cent of the cases. Logs are used around more of the beds than are boards. The records show that there were 17 old beds and 24 new ones. Several of the County Agents in South Carolina have seed cleaning machines in their offices with which they clean the seed for the farmers. Fifty per cent of the beds were planted with cleaned seed and only about one-third planted with treated seed. No seed treatment other than formaldehyde was noted. More than one-third of the beds were covered with old cloth which had not been sterilized in any case. (March 31 to April 2 and April 17, 18, 19).

TEXAS COTTON DISEASES

Bacterial blight (Bacterium malvacearum) was unusually severe this year on young seedlings, stunting and retarding growth in a good many cases. However, only a very small trace of the seedlings were actually killed by the disease.

Root rot (Phymatotrichum omnivorum) has appeared much earlier this year than usual. This seems to be surprising when we consider that weather conditions last winter were unusually cold and temperatures low. Everybody expected that such a severe winter would reduce root-rot. However, if we consider the fact that, in most cases, the ground did not freeze at all or froze only to a depth of 2 or 3 inches, it is easy to understand why root-rot was not much affected. (J. J. Taubenhaus, July 15.)

ANGULAR LEAF SPOT (BACTERIUM MALVACEARUM) IN ARIZONA

One field of 40 acres near Marana, 50 per cent loss. Cottonseed planted was "gin-run" Pima. An adjacent field of Pima, two weeks younger, presented an even, thrifty stand of clean, healthy plants. The latter was planted with sulphuric acid delinted seed. (J. G. Brown, July 15).

DISEASES OF TREES AND ORNAMENTALS

DISEASES OF TREES IN OHIO

JUNIPER

Blight (Phomopsis juniperovora). Common on transplants of Juniperus chinensis, var. Pfitzeriana and J. virginiana in nurseries.

MAPLE

Wilt (Verticillium sp.) Common on sugar maple. Causing death of a number of shade trees this year.

OAK

Blight (Gnomonia veneta). Common, causing some loss of leaves on white oaks.

Twig blight (Sphaeropsis sp.). Severe on Quercus robur gradually killing trees on Ohio Agricultural Experiment Station campus. Found on white oak but not commonly severe. Not found on red or pin oak.

SYCAMORE

Blight (Gnomonia veneta). Common but not as severe as in the two preceding years. (C. May, July 1.)

WILLOW DISEASES IN MASSACHUSETTS

Scab (Fusicladium saliciperdum). Last spring I discovered the presence of willow scab in Newbury, Massachusetts, and a little later in Magnolia, Massachusetts. The former case was recorded in the Plant Disease Reporter (Vol.XIV, May 1, 1930.) These infections are both located on the coast and considerably East of other reported localities. The disease is spreading slowly in the Newburg area and very rapidly in the Magnolia area. (Nathaniel O. Howard, July 22.)

Leaf spot and twig blight (Marssonia sp.). A willow leaf spot and twig canker is common on willows in various parts of the State, with active sporulation of a fungus on both leaf and canker, that resembles a Marssonia. Considerable die back of twigs appears to have resulted from the disease.(O. C. Boyd, July 3.)

ROSE CANKER IN MASSACHUSETTS

Stem canker (Coniothyrium fuckelii). A bad case of stem canker was found in greenhouses where industries lost 25 per cent of their grafted plants. Loss over 15,000 plants. (W. H. Davis, July 15.)

MULBERRY LEAF BLIGHT IN TEXAS

Leaf blight (Cercosporella mori). Very heavy infestation of leaf blight, particularly on trees growing in shaded areas. Trees growing more or less in the open do not seem to be so badly affected. (J. J. Taubenhaus, July 15,)

PLANT QUARANTINE NOTES

RECENT INTERCEPTIONS

Following the practice initiated in Number 9 of this volume some of the more interesting interceptions of plant pathogens made by Inspectors of the Plant Quarantine and Control Administration during the past three months are here listed. The data here presented has been obtained through the courtesy of Mr. H. S. Dean.

1. Cerotelium canavaliae and Colletotrichum canavaliae on Jack bean (Canavalia) from Porto Rico. Collected in connection with studies of Elsinoe on Lima bean.

2. Eksinoe canavaliae and Phakopsora vignae from Porto Rico. Collected in the field in connection with studies of the Elsinoe.

3. Sphaceloma sp. on rose cuttings from Ireland. (Philadelphia, March 20.)

4. Yellows and possibly other types of virus disease on Easter lilies from Japan. (Savannah, Georgia, April 8.)

5. Caconema radicicola (root knot nematode) on Dahlia roots from Belgium (Philadelphia, April 10.)

6. Macrosporium tomato, nail head rust, found on several occasions at Detroit on tomatoes from Mexico.

7. Sphaceloma fawcettii on lime (citrus aurantifolia) from Brazil. (Baltimore, April 21).

8. Actinomyces sp. (raised scab) on potato tubers from Esthonia. (New York, April 29.)

9. Spongospora subterranea (powdery scab) and Fusarium rot on potato tubers from Argentina (ships' stores). (Philadelphia, April 25.)

10. Sphaceloma fawcettii (scab) on lemons from Brazil. (Philadelphia, April 27.)

11. Sphacelotheca reilianum (smut) on broom corn from Russia. (New York, May 7.)

12. Puccinia asperifolii (rust) on rye straw from Mexico. (El Paso, May 4.)

13. Cercospora vaginae (red spot of leaf sheath) on sugar cane from Jamaica. (New York, May 21.)

14. Alternaria brassicae on cabbage from England. (Charleston, May 19.)

15. Phomopsis citri Fawc.(melanose) on orange from Brazil. (New Orleans, May 21.)

C O R R E C T I O N

Attention is called to an error in the Reporter for July 15, page 130, line 13. "Canker (Bacterium vesicatorium)" should read "Bacterial canker (Aplanobacter michiganense)."